STRATEGY RESEARCH PROJECT

COUNTERPROLIFERATION STRATEGY: THE INFLUENCE OF TECHNOLOGY, BUDGET, AND ARMS CONTROL ON THEATER MISSILE DEFENSES

BY

LIEUTENANT COLONEL GREG H. PARLIER
United States Army

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By

Lieutenant Colonel Greg H. Parlier
United States Army

Colonel Sanford D. Mangold
Project Adviser

U.S. Army War College
Carlisle Barracks, Pennsylvania 17013

ABSTRACT

AUTHOR: Greg H. Parlier (LTC), USA

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This paper describes the historical evolution of the theater missile threat during World War II and the Persian Gulf War, and analyzes current technological challenges, budgetary pressures, and arms control restraints which constrain the development and deployment of effective theater missile defenses. The impact of these trends on strategic concepts as outlined in the National Military Strategy and their implications for attaining national policy objectives is assessed. A systems approach is used to describe, analyze, and evaluate the effectiveness of emerging counterproliferation strategy within the framework of an ends-ways-means strategy formulation paradigm. I conclude that current trends will lead to a self-deterring strategy: resources are inadequate to support the ways we intend to achieve our national objectives. Recommendations are made to eliminate unacceptable risk and enhance the concept of "extended conventional deterrence" consistent with U.S. national values and security interests for our role in a new world order.

Introduction: Purpose and Organization

Previously, the Cold War threat was dominated by large numbers of manned aircraft targeted throughout the Central Region of NATO. Now, in the aftermath of the Persian Gulf War, an analysis of future threat options makes it clear that unmanned platforms - cruise missiles, ballistic missiles, and unmanned aerial vehicles - will increasingly become the weapons of choice especially when paired with warheads of mass destruction. Recognition of this emerging threat led to the announcement in December 1993 of the DoD Counterproliferation Initiative (CPI), central components of which address the challenges to regional security posed by this emerging missile threat.

This paper describes the historical significance of the theater missile threat, identifies our current response to this growing threat, and analyzes the impact of technological challenges, budgetary trends, and arms control issues which impose significant constraints on the development of effective theater missile defenses. The interaction of these factors and their impacts upon our principle strategic concepts of "overseas presence" and "power projection" are assessed within the context of theater warfighting strategy and joint operations doctrine.

A systems approach is used to describe, analyze, and evaluate the effectiveness of this new counterproliferation strategy within the framework of an ends-ways-means strategy formulation paradigm. While it may be too early to determine whether or not "counterproliferation" replaces "containment" as an organizing concept for U.S. National Security Policy, several trends suggest that the ongoing implementation effort is not likely to achieve policy objectives consistent with our National Security Strategy. Illuminating these trends and their implications are the central features of this research project.

The Evolution of the Theater Missile Threat

Following the Persian Gulf War, a mythology has arisen concerning the use of theater ballistic missiles. Some of these erroneous perceptions include the belief that this was the fist time such missiles had been used in combat; that they are notoriously inaccurate, hence useful only for terrorizing populations; and, consequently, that they are militarily insignificant weapons. However, an analysis of the history, development, and use of ballistic missiles serves to both dispel such perceptions and to provide a useful context for assessing the impact of emerging threat trends from TBMs, particularly when used as a delivery method for weapons of mass destruction. Before the 1991 Gulf War, ballistic missiles had been used extensively only three times: the Germans launched over 3,000 V-2 missiles against urban British and European targets during World War II; Iraq and Iran together launched nearly 1,000 missiles against each other between 1980-1988; and the Kabul government launched 2,000 SCUD missiles against Mujahideen guerrillas in the Afghanistan civil war. In all cases the missiles were armed with conventional high-explosive warheads.[1]

The British Experience in World War I

The British experience offers the most helpful historical perspective on the current debate because it was both unique and extensive, covering a thirty year period from 1915-1945. The modern era of "deep attack" really began on 19 January, 1915 when German Zeppelins first dropped conventional and incendiary bombs on Yarmouth, England during World War I. Two years later,

[1] George N. Lewis, Steve Fetter, and Lisbeth Gronlund, Casualties and Damage from SCUD Attacks in the 1991 Gulf War (Cambridge: MIT Defense and Arms Control Studies Program, 1993), 3-4.

the Gotha bomber offensive followed, including raids on London, Paris, and Italian cities. The raids on London ultimately caused about 5,000 casualties but their major consequence was the precedent they set for future wars.

The British experience of World War I indicated that theater defenses could be developed but were costly. Such defenses, however, were only partially effective, not "leakproof". Seizure of German airfields was ultimately necessary to ensure complete protection. Finally, the Zeppelin and Gotha offenses against London, despite causing relatively limited casualties, had a significant adverse strategic effect by inducing terror among the British people. This terror-inducing effect, seemingly disproportionate to the damage actually caused, diminished once the British people realized they were effectively though imperfectly defended.

The Allied Experience in World War II

Many challenges faced by the British during the Great War would arise again thirty years later during World War II. Unpreparedness and fear of Germany's aeronautic and rocket research program contributed toward Britain's pre-war vulnerability to German diplomatic coercion and intimidation. The civil and military policymakers responsible for British air defenses were alarmed by Hitler's reestablishment of the German air force (Luftwaffe). They remembered Germany's World War I air attacks and could see that London would soon again be vulnerable to attack. By 1938, the lack of an effective British air defense system contributed to Prime Minister Chamberlain's decision to negotiate the 1938 Munich Agreement allowing Hitler to annex Czechoslovakia.[2]

2 Robin Ranger, "Theater Missile Defenses: Lessons from British Experiences with Air and Missile Defenses," Comparative Strategy 12 (1993): 403

As the war progressed, terror-inducing effects of the Nazi strategic bombing campaign against London (the "Battle of Britain"), though temporarily neutralized by Britain's scientifically designed layered defenses against Luftwaffe air attack, would eventually incorporate German technological advancements, most notably the V-2 ballistic missile attacks, which completely overwhelmed British defenses. The Nazi *Velgeltungswaffe* (vengeance or reprisal weapon) Program consisted of the subsonic V-1 "buzz bomb", precursor to today's cruise missile, and the supersonic V-2 ballistic missile, which today's SCUD and its derivatives, such as the Iraqi al-Hussain, are direct technological descendants of.

As had the Zeppelin and Gotha offensives during World War I, the V-1 proved most useful generating public terror, but it also diverted considerable Allied resources to create an effective defense. The British employed 2,000 anti-aircraft guns, 21 fighter squadrons, and barrage balloons in three layers as "active defenses" against the missiles.[3] The two layers of "passive defenses" were early warning radars and a highly developed civil defense organization, including an extensive shelter and evacuation system.[4]

Overall, the British defense system had two important strategic effects. First, it reduced casualties and damage caused by the attacking V-1s by successfully intercepting them, though initially only a low percentage, then a significantly greater percentage, and finally intercepting over 90%. Second, as coordination among and within layers increased system effectiveness, the British people were reassured that they were being defended and that the

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3 Conrad C. Crane, "Countering Deep Theater Air Threat," unpublished manuscript (West Point:USMA, 1995), 5.

4 Ranger, 406.

defense was being rapidly improved.[5] Nonetheless, a British study after the war concluded that it cost three times to defend against V-1 attacks as it did to mount them[6] and the United States Strategic Bombing Survey later estimated that the V-1s inflicted almost four times as much damage to the Allies as it had cost the Germans to build them.[7]

Some of the V-1 sites were built to handle chemical and possible nuclear warheads as well. Fortunately for the Allies, this threat never materialized for a number of reasons. While the Germans had considerable stocks of deadly nerve agents like Tabun and Sarin, as well as biological agents like anthrax, they were deterred from using them by fears that the Allies could retaliate in kind and by concerns about safety and an Allied ability to develop an antidote. The German nuclear program was hindered by scientific shortcomings and by Allied commando and bombing raids on a key heavy water plant in Norway. Repeated attacks eventually forced the plant to close, and when the remaining heavy water stocks were transferred to a barge to cross Lake Tinnsjo, Norwegian agents managed to blow it up.[8]

Unlike the combinations of active and civil defenses that eventually blunted the V-1 attacks, Britain had no defenses against the supersonic V-2, the world's first tactical ballistic missile (TBM). The V-2, a gyroscopically-guided, fin-stabilized, liquid-fueled rocket with a range of 180-220 miles, was developed by the German army independent of, but in competition with, the Luftwaffe V-1. Unlike the relatively slow V-1, the V-2 was launched in a ballistic trajectory, impacting at about 2,500 miles per hour, making it

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5 Ibid.

6 Kenneth Werrell, The Evolution of the Cruise Missile (Maxwell AFB, AL: Air University Press), 43-61.

7 David E. Snodgrass, Attacking the Theater Mobile Ballistic Missile Threat (Maxwell AFB, AL: Air University School of Advanced Air Power Studies), 82.

8 Michael Wheeler et all., Implications of The Counterproliferation Initiative for the U.S. Army (Washington: SAIC), 61-63.

impossible to stop and invulnerable to all defensive measures of the time. Like the V-1, it lacked the accuracy for anything other than urban attack and records later uncovered in the German archives reveal early plans had been made to arm them with chemical warheads as well. Because of delays caused mainly by Allied bombing, the V-2 campaign did not begin until September, 1944, almost a year late and three months after the start of the V-1 campaign.[9]

Between 8 September 1944 and 27 March 1945, the Germans fired between 2,600-3,000 V-2s toward Allied territory. The V-2 initially caused few casualties and seemed less threatening than the V-1, however this perception quickly changed. On 25 November 1944, a single V-2 produced 268 casualties in London; another V-2 killed 160 shoppers in a Woolworth's store; and on 16 December 1944 a V-2 aimed at Antwerp killed 271 people in a packed theater.[10] Altogether during the V-2 offensive, 518 V-2s hit London causing 21,380 civilian casualties, including 2,511 deaths. In addition, these V-2 attacks destroyed 20,000 houses and damaged some 580,000.[11] Once again, despite the diversion of significant Allied military resources, the threat was ultimately eliminated only when the Allied ground attack actually overran and occupied missile launch sites in northern France and Germany toward the end of the war.

With the V-2, the Germans achieved a technological breakthrough completely invulnerable to the British low-altitude active defense system which proved effective against the V-1. "Passive" civil defense measures were equally ineffective against the V-2 since there was no early warning or protective action before missile impact. Thus, Allied bomber "attack operations", designated

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9 Ibid., 66.

10 Ibid.

11 Snodgrass, 75, and Ranger, 406-407.

Operation CROSSBOW, provided the only available means to counter the V-2. Massive air raids were launched against the V-weapon sites and, though never implemented, airborne infantry raids directly onto the launch facilities were seriously considered.[12] This intense bombing had consequences unintended by the Allies, further complicating effective attack operations. The Germans quickly dispersed their launch sites, learned the value of decoys, and relocated their production facilities. Mobile V-2 launch platforms, extensive use of camouflage, and deliberate placement of launch sites in populated Dutch cities all made the bombing effort less than effective.

Most historical emphasis has focused on the actual strategic impact and terror-inducing effects of the V-weapon campaign against the city of London during World War II. Less recognized, but clearly relevant to our rapid, decisive "power projection" strategic concept today, was the potential threat faced by the Allied Expeditionary Forces at the operational and tactical levels of war.

Eisenhower recognized the potential danger these missiles posed to the massive staging base in England and the ports of embarkation along the Southern Coast of England from which his expeditionary forces would launch:

> It seemed likely that, if the Germans had succeeded in perfecting and using these new weapons six months earlier than they did, our invasion of Europe would have proved exceedingly difficult, perhaps impossible. I feel sure that if they had succeeded in using these weapons over a six month period, and particularly if they had made the Portsmouth-Southampton area one of their principal targets, OVERLORD might have been written off.[13]

Historian Martin Blumenson argues that Hitler blundered by using the missiles to terrorize London, allegedly in retaliation for Allied strategic bombing attacks on German cities.

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[12] Wheeler, 67.

[13] Dwight D. Eisenhower, Crusade in Europe (New York: De Capo Press, 1979), 216.

> Had he instead sent the missiles against military targets - for example, the crowded harbors working at full capacity to nourish the invasion - he might well have paralyzed the Allied buildup.[14]

The wartime commander of the 82nd Airborne Division, Major General Jim Gavin, wrote in his memoirs that he fully expected the takeoff airfields, bloated with airborne and glider forces after the D-Day postponement, to be attacked: "Then D-Day was postponed one day. Nevertheless, calm and quiet prevailed, and the expected attacks by the German air force and V-bombs did not materialize."[15]

Later, after the Normandy breakout, the V-2 offensive adversely affected Allied ground operations by creating an urgent need to eliminate the V-2 launch sites in Holland. The V-2s were now falling on England prompting Londoners to vent their anger against Churchill rather than Hitler. Field Marshall Montgomery, arguing against a "broad front" campaign, succeeded in convincing Eisenhower to launch Operation MARKET-GARDEN in order to capture the V-2 launch sites thereby reducing both the social strain on London and the political strain on Churchill while also opening Antwerp to relieve a rapidly deteriorating logistics situation.[16] Unfortunately, as soon as the Allies attacked, the Germans immediately pulled their V-2s back to Germany and Northern Holland.[17] The operation ultimately failed and the Allies suffered more casualties than on D-Day, including a high percentage of their elite airborne forces.

Finally, as the ground advance across France gained momentum and

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14 Martin Blumenson, The Battle of the Generals (New York: William Morrow , 1993), 97.

15 James M. Gavin, On to Berlin: Battles of an Airborne Commander 1943-1946 (New York: The Viking Press, 1978), 98-99.

16 Ibid., 135.

17 David Johnson, V-1, V-2: Hitler's Vengeance on London (New York: Stein and Day, 1981), 23.

approached the Rhine, General Bradley described in his memoirs the seizure of the Remagen bridgehead, the tactical chokepoint through which the final assault into the German heartland would begin:

> The Remagen bridgehead was not easily exploited. Hitler was naturally furious that it had been taken...The Germans rushed elements of some twelve divisions (including four Panzers) onto the bridgehead... The Germans brought up heavy artillery, aircraft, floating mines, frog men. They even fired 11 V-2s at the bridge - the first and only tactical use of either V-weapon in the war.[18]

The historical experience of the British and Allied forces during World War II had much in common with earlier results in World War I. Layered defenses in depth, though costly, initially increased an effectiveness but were eventually overcome by technological overmatch once the V-2 offensive started. Despite diversion of considerable Allied air assets to defend against the V-1 and to attack launch facilities for the V-1 and the V-2, the Germans employed simple but successful countermeasures such that ultimate defeat against their launch sites required a ground offensive.

The terror-inducing effect again had strategic significance. Although damage in London was considerable, and casualties certainly not insignificant (though less than 10% of all British civilian casualties suffered during the war), the V-campaign triggered an Allied reaction and diversion of resources out of proportion to the actual number of casualties they caused. Operation CROSSBOW flew 68,000 sorties to drop 122,000 tons of bombs on V-weapon sites at a cost of 450 planes and 2,900 crewmen lost.[19] Strategically, this diversion of resources was costly. Though this conclusion is surely warranted at the strategic level, the belief persists that V-weapons were militarily inconsequential at the theater and tactical levels in the European Theater of

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[18] Omar N. Bradley, A General's Life (New York: Simon and Schuster, 1983), 407.
[19] Ranger, 407.

Operations. The lessons we must draw as relevant for today should not be derived solely from what actually occurred, but rather, as Eisenhower, Bradley, and Gavin feared at the time and as Blumenson has later suggested, what Hitler and Germany could have done with their TBM capabilities had they simply chosen to do so.

The Coalition Experience in the Persian Gulf War

The V-campaign of World War II was, in several ways, a prelude to the Iraqi SCUD campaign during Desert Storm. The experiences of Coalition forces in the Gulf War trying to counter SCUD attacks have much in common with the Allied campaign against the V-weapons in World War II. A persistent belief that such weapons would constitute a mere nuisance and were of little military significance was reflected by the CENTCOM CINC ("militarily..in the grand scheme of warfare, a mosquito"[20]) and exacerbated by faulty and inadequate pre-war intelligence.[21]

Just as its technological predecessor had done against the Allies in World War II, the Iraqi SCUD threat politically strained the Coalition, causing considerable resources for defensive and offensive operations to be diverted against it. The Coalition anticipated that Iraq might use SCUD missiles against Israel and, after the first strike of seven SCUDs fired at Tel Aviv and Haifa on 18 January 1991, the United States deployed Patriot missiles to Israel, marking the first time that U.S. combat forces were stationed there. Despite the Patriot presence, the SCUDs caused a major disruption in Israel.

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[20] H. Norman Schwarzkopf, It Doesn't Take a Hero (New York: Linda Grey Bantam Books, 1992), 417.
[21] Michael R. Gordon and Bernard E. Trainor, The Generals' War (Boston: Little, Brown and Company, 1995), 228-229.

Schools were closed, the nation's business activity suffered, and, in the end, following 15 subsequent attacks involving 29 SCUDs, four Israelis were dead, 289 injured, and 4,000 were homeless.[22]

Before the air campaign started, U.S. war planners estimated that Iraq's SCUD force and support structure constituted no more than 100 targets. It was estimated that a single squadron of F-15E fighter-bombers could accomplish the SCUD mission. This assumption proved unfounded. As SCUD launches continued throughout January and into February, the number of aircraft devoted to "the great SCUD hunt" was tripled, requiring nearly 100 sorties per day.[23] The anti-SCUD effort would eventually consume more than 20% of strategic air campaign sorties.[24]

Reminiscent of similarly designed British defenses half a century earlier, the coalition quickly fabricated a layered defense in depth. Nonetheless, we rediscovered the problems of finding mobile missile launchers and the difficulties destroying them from the air. Though Coalition air attacks quickly destroyed all exposed fixed launch sites, the attack on SCUD mobile launchers, reminiscent of the Allied effort against V-2s earlier, was a failure. By the end of August, 1990, the Iraqis had dispersed their mobile launchers to Western and Southeastern Iraq where they continued to operate until the end of the conflict. Mobile launchers proved difficult to target by strike aircraft and to mislead coalition aircraft, the Iraqis employed numerous decoys, some indistinguishable from the actual launcher beyond 25 yards. In addition, SCUD launch crews streamlined Soviet launch procedures from hours to minutes, and practiced emission control and light discipline during night

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22 Bruce W. Watson et all., Military Lessons of the Gulf War (California: Presidio Press, 1991), 187-188.
23 Wheeler, 84.
24 Richard G. Davis, Strategic Air Power in Desert Storm (Washington: Air Force History and Museums Program, n.d.), 44.

operations.[25] Although Coalition air crews crisscrossing Iraq spotted SCUDs streaking upward after launch more than three dozen times, they never destroyed a vehicle that was later indisputably confirmed as a SCUD launcher.[26] By early February, after Coalition air forces had expended more than half of their total effort against SCUDs, there were still no confirmed kills of mobile launchers.[27]

The unanticipated requirements of "the great SCUD hunt" diverted strategic air campaign sorties that were originally intended to destroy Iraq's conventional weapons production and repair capability including small arms, artillery, ammunition, armored vehicle and aircraft engine maintenance and repair facilities. Although air power had the capacity to virtually eliminate this target set, due to the unanticipated magnitude of the SCUD hunt, only about 30% of the conventional weapons logistics infrastructure was destroyed or damaged. Militarily, the SCUD effort was a successful strategic diversion imposed by the Iraqis on the coalition since sorties devoted to the search for these elusive mobile launchers could have damaged targets of more lasting significance. Also, as the U.S. Army's official history notes:

> The diversion of air power to fly SCUD combat air patrols and the intelligence to support counter-SCUD operations directly impeded the effort against Iraqi ground forces in the KTO. SCUD busting extended the air effort by more than a week. Ultimately, the SCUD hunt meant that ARCENT targeting goals would not be reached before the beginning of the ground war.[28]

Our makeshift "active defense", the Patriot anti-tactical ballistic missile effort, though seemingly successful at the time, and certainly a uniquely

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[25] Ibid.

[26] Rick Atkinson, Crusade: The Untold Story of the Persian Gulf War (Boston: Houghton Mifflin, 1993), 147.

[27] Davis, 44-45.

[28] Robert H. Scales, Certain Victory: The U.S. Army in the Gulf War (Washington: Brassey's, 1994), 187.

decisive polito-diplomatic weapon that neutralized Saddam Hussein's effort to split the Coalition, proved to be, in retrospect, marginally effective at best, possible nearly totally ineffective in actually hitting and destroying incoming SCUD warheads. Originally designed as an air defense missile system, the Patriot was quickly modified by software upgrades to provide a limited TBM defense against the SCUDs. Of the 88 SCUDs fired by Iraq, public reports indicate that 47 were engaged by a total of 158 Patriot missiles. However, the degree of success of the Patriot has since been hotly debated, with some critics skeptical whether any successful engagements occurred.[29]

The Patriot anti-tactical missile capability (PAC-2) was designed to counter an advanced TBM whose performance parameters could be predicted. Consequently, the very crudeness of Iraq's al-Hussain, a cheaply modified SCUD, increased the Patriot's challenge since it had to intercept an incoming missile that was often in the process of breaking up. Hitting the incoming warheads as they wobbled unpredictably was further complicated by debris from disintegrating missiles. These SCUDs, in effect, though certainly not by superior design, inadvertently created their own decoys. Eleven software improvements by Raytheon, manufacturer of the Patriot, were necessary to give the Patriot an anti-tactical ballistic missile capability.[30] Nonetheless, an infinitesimal timing error accumulated causing the single most lethal event of the war when a SCUD, undetected due to an unanticipated "surveillance range gate error" caused by long term, continuous radar operations, crashed into a warehouse barracks in Dhahran on 25 February 1991, killing 28 American

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[29] Theodore A. Postol, "Lessons of the Gulf War Experience with Patriot," International Security 16 (Winter 1991-92): 119-171.

[30] Scales, 183.

soldiers and wounding 98 others.[31]

Despite a massive effort to destroy the evasive mobile SCUDs by air attack, launches continued until Special Operation Forces (SOF) actually controlled and occupied SCUD launch regions on the ground, demonstrating again the decisive importance of ground attack operations learned from World War II. Some 250 British SAS commandos were joined by nearly 900 American special operations personnel. Aggressive patrolling and use of air strikes pushed the mobile SCUD forces into more limited launching areas in Western Iraq and near the Syrian border. However, the Iraqis made excellent use of mobility, deception, and concealment tactics including the use of decoys with radar reflectors and heat generators. Planners soon determined that the number of mobile launchers had been sharply underestimated, partly because Iraq had converted heavy trucks into mobile launchers.[32] More than 100 SCUD missiles survived, as well as missile production equipment, at least 19 mobile launchers, and components for a new two-stage missile.[33]

Finally, as in the earlier Allied experience, less publicized events occurred during the Gulf War which portend significant military challenges for operational contingency planning to support U.S. and Allied force projection operations in the post-Cold War era.

As had occurred nearly 50 years earlier after the initial V-1 onslaught in June 1944, the Allies once again seriously considered airborne infantry assaults directly onto suspected launch areas.

> The 82nd Airborne Division, at Schwarzkopf's request, drafted a plan to parachute two brigades and insert a third by helicopter around H-2 and H-3. Although enthusiastically

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31 Atkinson, 417 and John Mueller "The Perfect Enemy: Assessing the Gulf War," Security Studies15 (Fall 1990): 104.

32 Wheeler, 84, and Scales, 184-186.

33 Atkinson, 496.

> supported by the division commander ("If you want to send a message to the world that you're serious about SCUDs, drop the goddamn 82nd airborne on them" Major General Jim Johnson urged), the plan was deemed too risky.[34]

A few missile impacts narrowly averted disrupting Saudi port debarkation operations, recalling Eisenhower's earlier worries that the OVERLORD force buildup and expansion would be paralyzed by missile attack. In one unpublicized episode, a SCUD hit the water just 130 yards off the port side of the USS *Tarawa* as it docked at Al Jubail to unload Marine AV-8 Harriers. Fortunately, the missile warhead did not detonate.[35] And SCUD attacks on Al Jubail and Ad Damman caused four civilian ship captains to pull back into the Gulf before being coerced in to complete port unloading, delaying delivery of much needed combat elements of VII Corps.[36]

The failure to stop the SCUD launches also posed a danger to Coalition troops as huge numbers who had just deployed from Germany waited for their equipment in crowded camps near the ports. A VII Corps internal after action report noted that:

> the very nature of the deployment could have changed to that of a national disaster. The loss of life that occurred in Beirut in 1983, or in Dhahran on 25 February 1991 from a SCUD strike, might have been magnified many fold in the densely packed warehouses, tent camps, and high rise apartments of December or January."[37]

Later, after the buildup was complete and the ground campaign started, Lieutenant General Fred Franks, VII Corps Commander, expressed the same concerns General Bradley feared earlier at Remagen when attacking ground

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[34] Ibid., 146.

[35] Gordon and Trainor, 238.

[36] Bryon E. Greenwald, SCUD Alert! The History, Development, and Military Significance of Ballistic Missiles on Tactical Operations, Association of the United States Army Series on Land Warfare Papers (Arlington: AUSA, 1995), 13, and Atkinson, 257.

[37] Gordon and Trainor, 240-241.

units were forced to congregate in order to penetrate tactical battlefield chokepoints. The similarity to the V-2 attacks against the Remagen bridgehead was striking: Franks expressed particular concern about chemically-armed SCUDs landing on his vulnerable troops while they attempted to breach belts of Iraqi mine fields. He ordered two Patriot batteries forward to provide missile defense over the narrow breach lanes through the minefields.[38]

The modified SCUDs employed by the Iraqis reinforced the forgotten lesson of the V-2 campaign against England. Even relatively crude, inaccurate weapons that are capable of striking cities and populations at a distance pose lethal threats and trigger popular demands for military responses disproportionate to the actual damage being caused.

Despite the subsequent debate on Patriot effectiveness, American observers in Tel Aviv during the war reported that the Patriots provided a psychological boost to the population under siege. At one point early in the SCUD campaign against Israel, the Israeli leadership strongly advocated an Israeli military response to the SCUDs by sending their ground forces into Iraq to seize and hold the areas from which SCUD launches were taking place. Had the Iraqis used the chemical warheads on their SCUDs which they had developed and stockpiled, the Israelis would likely have resorted to retaliatory strikes. Any of these outcomes could have fragmented the coalition and dramatically affected the dynamics of the war.[39]

Similarly, if SCUDs had struck the ports of Al Jubail or Al Damman when they were jammed with unloading troops, the results would have been far worse. If Iraq had mounted chemical warheads on their missiles, even the primitive, inaccurate SCUDs could have caused widespread panic among the

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[38] Greenwald, 16.

[39] Wheeler, 85.

Saudis and those sent to protect them. Had the catastrophe at the Dhahran warehouse barracks occurred early in the war rather than at the end, the psychological impact at home and in the field would have been far greater. Though a consequence of blind chance and bad luck, it was also a reminder of the Coalition's extraordinarily good fortune. As it was, the calamity merely provided a sad footnote in the chronicle of triumph.

Indeed, a primitive missile based on 50-year-old V-2 technology had come closer than previously imaginable to endangering the Coalition and altering the course of the war. Historically, the Desert Storm SCUD campaign resurrected the search for a counter to the tactical ballistic threat created by the Nazis half a century earlier. That search had remained largely dormant during the intervening years but would soon reinvigorate U.S. missile defense efforts in the new post-Cold War era.

The Emerging Threat and the Counterproliferation Initiative

Fears during the Gulf War that Iraq would use chemical or biological weapons against the Coalition forces, reinforced by post-war revelations about the scope of its nuclear, chemical, and biological weapons activities and missile development programs, have served as a proliferation wake up call for the U.S. defense community. Superimposing the historical lessons of our past experience with theater missiles upon the concerns of the present, U.S. policymakers quickly concluded that:

> The global proliferation of ballistic missile technology and weapons of mass destruction has become one of the most immediate and dangerous threats to U.S. national security in the post-Cold War era.[40]

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[40] Les Aspin and William Dickinson, Defense for a New Era: Lessons of the Persian Gulf War (Washington: Brassey's, 1992), xxvi.

The Threat

Despite several recent diplomatic successes in impeding or even reversing WMD and missile proliferation (Argentina, Brazil, South Africa, South Korea, and Taiwan), the post-Cold War environment is characterized by an increasing number of states with such capabilities. Of increasing concern is the inadequacy of traditional non-proliferation measures to thwart production and slow dispersion of missile and WMD technology to nations that refuse international norms. For the so-called "rogue nations", including Libya, Iran, Iraq, and North Korea, and other radical transnational organizations, the issue is a simple matter of economics. Considering their potential destructive power and ability to incite terror, WMD are incredibly cheap and relatively easy to produce or acquire. The combination of WMD warheads attached to theater-range missiles (ballistic and cruise) now constitutes the "poor man's arsenal".

This trend is clearly reflected in the global proliferation of both missile delivery systems and WMD: of the 185 states with membership in the United Nations, 8 or more have nuclear weapons, 20 or more have chemical weapons, and 8 to 10 or more possess biological weapons.[41] More than 20 nations currently have some ballistic missile capability, though relatively few in the developing world have the capacity to actually produce their own missiles.[42] There is, however, a high degree of correlation between ballistic missile and chemical weapons acquisitions. There are few countries with ballistic missiles that are not seeking to develop a chemical capability and only a few countries

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41 Barry R. Schneider, Radical Responses to Radical Regimes: Evaluating Preemptive Counterproliferation (Washington: National Defense University Press, n.d.), 3.

42 W. Thomas Wander, "The Proliferation of Ballistic Missiles: Motives, Technologies and Threats," The Proliferation of Advanced Weaponry: Technology, Motivations, and Responses, ed. W. Thomas Wander and Eric H. Arnett (Washington: American Association of for the Advancement of Science, 1992), 76.

with chemical weapons not developing a ballistic missile capability.[43] For rogue nations, these weapons are "a ticket to power, stature, and confidence in regional war",[44] providing them with an asymmetrical approach to counter U.S. conventional superiority. According to Secretary of State Warren Christopher, such a capability could

> ...give rogue states disproportionate power, destabilize entire regions, and threaten human and environmental disasters. They can turn local conflicts into serious threats to our security.[45]

Obviously, with respect to the emerging threat from ballistic missiles and weapons of mass destruction, "Third World" does not mean third rate.

The Response

The recognition that non-proliferation measures alone will prove insufficient has spurred attention to countering these new threats. In fact, the spread of WMD has become a "defining risk" of the post-Cold War era and the "dominant threat to U.S. national interests".[46] This perception has been expressed in all of our recently published national security documents: "a critical priority for the United States is to stem the proliferation of WMD and their missile delivery systems"[47]; "one of the most troubling dangers we've

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43 David Rubenson and Anna Slomovic, The Impact of Missile Proliferation on U.S. Power Projection Capabilities (Santa Monica: RAND Corporation, 1990), 20

44 William J. Perry, Proliferation: Threat and Response (Washington: Office of the Secretary of Defense, 1996), iii.

45 Wheeler, 52.

46 Michael J. Mazarr, "Going Just a Little Nuclear: Nonproliferation Lessons from North Korea," International Security 20 (Fall 1995): 92.

47 William J. Clinton, A National Security Strategy of Engagement and Enlargement (Washington: USGPO, 1995), 13.

faced...increasing the risks we face"[48]; "the President has declared combating proliferation a national emergency"[49]; and "the proliferation of these horrific weapons presents a grave and urgent risk to the United States and our citizens, allies, and troops abroad. Reducing this risk is an absolute priority of the U.S."[50]

The U.S. policy response to the spread of WMD, announced by former Secretary of Defense Les Aspin on 7 December 1993, is the "Counterproliferation Initiative" (CPI). This initiative, when fully implemented by DoD, is intended to deter, defend, and protect against the use of WMD in the event that traditional non-proliferation efforts such as preventive diplomacy, arms and export controls, collective security and security assistance, fail to prevent WMD proliferation and their use. Comparable to earlier Allied and Coalition designs during World War II and the Persian Gulf War, the DoD CPI envisions four principle components, or "pillars", for effective theater missile defenses: attack or counterforce operations; active missile defense efforts; passive defense measures; and an overarching command, control, and battle management capability.

Attack operations are primarily preemptive efforts, conducted by precision guided munition (PGM) capable systems and Special Operations Forces (SOF), to identify, locate, and destroy or neutralize threat capability to deliver WMD. Active defense consists of various upper- and lower-tier theater missile defense systems intended to intercept threat missiles during both the ascent and descent phases of the ballistic trajectory. Army land-based systems include Patriot PAC-3 and Theater High Altitude Area Defense (THAAD); Navy

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[48] John M. Shalikashvili, National Military Strategy of the United States of America: A Strategy of Flexible and Selective Engagement, (Washington: USGPO, 1995), 3.

[49] John P. White, Directions for Defense: Commission on Roles and Missions of the Armed Forces (Washington: Office of the Secretary of Defense, 1995), 2-14.

[50] Perry, iii.

sea-based systems are the Aegis IV A missile and a "THAAD-like" area system called the Lightweight Exoatmospheric Projectile (LEAP); and Air Force boost-phase concepts include both kinetic hit-to-kill and laser directed energy systems. Passive defense includes force protection measures such as tactical warning for dispersal and cover, medical defense protection such as inoculations and vaccines, as well as NBC protective and decontamination equipment. Battle management includes fusion of national, theater, and tactical intelligence with a command, control, and communications capability to orchestrate, coordinate, manage, and conduct attack operations, active TBM defenses, and passive force protection.

Although the civilian defense policy and acquisition communities, the Joint Staff, and the individual military services all have focused on the "proliferation problem" and the seemingly comprehensive conceptual approach offered by the CPI, several obstacles to TMD implementation have emerged in recent years. An objective assessment of the interaction of these factors reveals several inadequacies which must be recognized and either corrected or compensated for if the United States is to perform rapid, casualty-limited, decisive force projection operations in the future as envisioned by our implementing strategic concepts of "overseas presence" and "power projection".

Analyzing the Means

As one recent study for the Army Staff has suggested, there are various dimensions and aspects of the counterproliferation challenge which reflect the conjunction of several forces:

> The breakup of the former Soviet empire and the uncertain prospects of the vast reservoir of WMD materials and expertise that the Soviets accumulated;

> the revelations after the Gulf War of how far the Iraqis had progressed in their WMD programs; an accelerating diffusion of advanced technologies globally; the ambitions of regional leaders like Saddam Hussein, whose behavior absent Cold War dynamics may be even more threatening; the search for a new organizing vision to replace containment; the reengineering of strategy, force structure, defense organization, and industrial bases to meet the demands of the new threat environment; the natural tendency of a new American administration to put its personal stamp on defense policy; and other such dynamics.[51]

Although all of these impact with varying degrees upon the policy milieu, my research suggests that these can be limited to a few dominant issues. Key among these are technological challenges, budgetary pressures, and international arms control issues.

Technology Challenges to Theater Missile Defenses

The technical engineering demands required to develop anti-tactical missile systems that can achieve a near-leakproof defense capability are immense. Adapting air defense systems, such as Patriot and Aegis, which were originally intended to engage slow moving, large radar cross section (RCS) aircraft, to systems which must now detect missiles and discriminate warheads with speeds orders of magnitude faster and electronic signatures orders of magnitude smaller is an enormous challenge. Additionally, despite the $44 billion spent by the Strategic Defense Initiative Organization (SDIO) since its creation in 1983[52], the development and demonstration of a consistent hit-to-kill, kinetic energy intercept capability has proven both expensive and elusive.

Incoming TBMs, especially cheap SCUDs and their variants, tend to

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[51] Wheeler, 4.

[52] Steven M. Kosiak, Nonproliferation and Counterproliferation: Investing for a Safer World? (Washington: Defense Budget Project, 1995), 39.

break apart upon reentry, making actual warhead discrimination extremely difficult. Radar aperture power on the order of millions of watts per square meter is required. As the TBM breaks apart during terminal descent into the lower atmosphere, reentry dynamics are such that the target suffers from a randomly changing center of gravity causing aerodynamic forces to induce extremely high lateral accelerations resulting in a random, unpredictable, wobbling effect. Closing speeds between the warhead and interceptor are so high that fragmentation warheads, intended to compensate for the inevitable near misses caused by this wobbling effect, are rendered ineffective due to the differential between closing velocity and warhead fragmentation velocity. Unlike aircraft targets, missile warheads are not characterized by large, flat vulnerable surfaces easily penetrated by shrapnel from expanding fragmentation warheads detonated by proximity fuses. Yet, hit-to-kill kinetic energy intercepts , though essential to assure high probability of submunition destruction, approach the limits that engineering physics allows.[53]

Also, optimal engagement altitudes for TBM warheads may be different depending upon whether the warhead contains a nuclear warhead, chemical or biological submunitions. As these many challenges suggest, the frequently advertised analogy to "a 'silver bullet' hitting another bullet" is grossly understated and simply incorrect. A bullet follows a well defined, predictable ballistic trajectory. But, as Gulf War TV video clearly showed, theater ballistic missiles, heated and buffeted by the increasingly dense atmosphere during their terminal reentry phase, do not.[54]

In addition to these demanding technological engineering challenges that

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53 Thomas Morgan, "Tactical Defenses Against Missiles: Implications for Strategy," The Proliferation of Advanced Weaponry: Technologies, Motivations, and Responses (Washington: Association for the Advancement of Science, 1992), 262.

54 George N. Lewis and Theodore A. Postol, "Video Evidence on the Effectiveness of Patriot During the 1991 Gulf War," Science and Global Security 4 (1993): 1-63.

must be overcome, effective missile defenses must be designed so that a resourceful and intelligent adversary cannot easily circumvent them. However, each of the five interdependent tasks that active defense systems must perform (detection, discrimination, tracking, interceptor guidance, and target destruction) are vulnerable to relatively simple countermeasures that could degrade or even collapse the entire defense.[55] Such countermeasures include defense saturation, decoys, radar blackout, jamming, radar vulnerability to stealth technology, defense leakage, and salvage fusing.[56] In fact, short-range theater missile defenses appear to be even more vulnerable to countermeasures than longer range strategic defenses partly because TBMs operate at speeds fast enough to severely stress the technological requirements on defenses, while at the same time speeds sufficiently slow not to stress the missile technology required by the offense.

The cumulative effect of these technological engineering design challenges and countermeasures to them are dramatic, resulting in low single-shot kill probabilities (SSKP) which increase the chance of warhead penetration. It is recognition of this "leakage", or inability to obtain high confidence of single intercept kills, that has lead to the design of "multi-layered" systems for sufficient defense in depth to provide multiple engagements against an incoming missile.

Accordingly, the United States is currently embarked on an aggressive TMD acquisition program with at least ten active defense TMD systems in production or under development. Today's existing "terminal defense" systems are designed to intercept TBMs in their final two minutes of flight. Other

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[55] Benoit Morel and Theodore A. Postol, "ATBM Technologies and NATO," Defense and Arms Control Studies Program lectures in "Technology and Policy of Weapons," MIT, Cambridge, MA, Fall term 1994: 21-55.

[56] Joseph Peterson, "Theater Missile Defense: Beyond Patriot?," (Master's Thesis, Naval Postgraduate School, Monterey, California, June 1994), 62.

proposed TMD systems, such as the Boost Phase Interceptor (BPI) and the Airborne Laser (ABL) target the threat missile within the first two minutes of flight. The Ballistic Missile Defense Organization (BMDO), successor to SDIO, is currently developing a TMD "core program": the Army Patriot PAC-3, the Navy Aegis lower-tier system, and the Army THAAD. Long term projects include the Navy LEAP sea-based upper tier, the Air Force BPI and ABL programs, and the Army Corps Surface-to-Air Missile (Corps SAM), recently established as an international program known as Medium Extended Air Defense System (MEADS). The upper-tier and lower-tier designations refer to exoatmospheric (>100 km) and endoatmospheric (<100 km) altitude capability. The three "layers" of the BMDO TMD architecture, then, incorporate acquisition programs for each layer: boost-phase TMD systems (Air Force kinetic-kill interceptor and airborne laser programs); midcourse defenses (Army THAAD and Navy Aegis LEAP upper-tier programs); and terminal-phase, point defenses (Army Patriot PAC-3 and MEADS and the Navy Aegis lower-tier program).[57]

The demands induced by difficult target discrimination and tremendous closing velocities, making direct hit warhead intercepts problematic, are further compounded by severe time compression of the engagement cycle where fractions of a second become decisive (for example, a fragmentation warhead must detonate within a timespan of one ten thousandth of a second in order to achieve a high probability of target intercept). Designing, a multi-layered architecture which can accommodate such a strenuous environment will entail the development of a so-called "complex, tightly coupled system". Such technologically sophisticated systems, which push the state-of-the-art, are prone to experience unexpected interactions between the layers which can result in system failure. Such a condition is especially likely if the system

[57] Ibid., 56.

must work perfectly the very first time it is "turned on". Furthermore, the implementation of complex, tightly coupled systems requires supporting organizational designs which are incompatible: "centralization is required to cope with tight coupling" yet "decentralization is required to cope with unplanned interactions or failures". Consequently, complex organizations which must deal with high risk technologies will inevitably incur accidents.[58] An example, relevant to the challenges for an effective TMD, is provided by the SCUD impact at the end of the Gulf War when an unnoticed system timing error allowed a SCUD, undetected, to impact causing the most lethal event of the war. Paradoxically, though layered systems are needed to attain a reliable level of system effectiveness, organizational dilemmas suggest that such a high degree of reliability is unlikely and that failures, possibly catastrophic, will inevitably occur.

Finally, the development of an effective direct hit, kinetic-kill-vehicle (KKV) has been difficult to consistently demonstrate. Great controversy still surrounds the 1984 SDIO homing overlay experiment (HOE) test, conducted at Kwajalein Range in the Pacific, which was touted as the first successful intercept of an incoming ICBM by an interceptor.[59] Such skepticism has been further fueled by the recent failures of both LEAP and THAAD to achieve direct hits during demonstration tests.[60] Perceptions are thus created which suggest that the necessary technology cannot be demonstrated or, at best, that the program is not "mature" and must therefore be delayed.

Recent studies illuminate the dramatic effect these technological

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58 Charles Perrow, Normal Accidents: Living with High Risk Technologies (Basic Books, 1984), 330-333.

59 David B.H. Denoon, Ballistic Missile Defense in the Post-Cold War Era (Boulder: Westview Press, 1995), 13.

60 "Kaminski Calls Navy LEAP 'Limited Narrow' Kill Vehicle Solution," Inside Missile Defense, 2, no.6 (20 March 1996): 8, and "Army, Lockheed Martin Ponder Future THAAD Tests," Inside Missile Defense 2, no.7 (3 April 1996): 8-9.

challenges, countermeasures and other limitations have upon active TBM defenses. Suggestive of the historical performance of Patriot during the Gulf War where actual intercepts were well below the customary 70%, 80%, or even 90% performance levels frequently ascribed to TMD systems in analytical studies, a series of recent RAND analyses indicate that both terminal and mid-course defenses may be inadequate against even moderate threats.[61] Consequently, any future successful (near-leakproof) TBM defense must include both counterforce (attack operations) and active defense. Without counterforce it will be relatively easy for the enemy to overwhelm an active defense system, especially if the active defense is limited to only terminal, point defenses such as PAC-3. However, a small improvement in counterforce effectiveness sharply decreases the expected number of weapons required for active defense. These studies show that a system which can successfully destroy TBM launchers and their crews will provide considerable leverage in reducing the numbers of active defense weapons required.[62]

TMD Costs and Budget Pressures

The procurement of multi-layered missile defenses, mandated by both Houses of Congress in the Missile Defense Act of 1991, has proven to be an enormously expensive endeavor for which adequate and sustained funding support has not materialized.[63] Growing federal budgetary pressures, both external to and within DoD, including bipartisan support to reduce deficits

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61 Richard Mesic, "Defining a Balanced Investment Program for Coping with Tactical Ballistic Missiles," and Russ Shaver, "Priorities for Ballistic Missile Defense," in New Challenges for Defense Planning: Rethinking How Much is Enough, ed. by Paul K. Davis (Santa Monica: RAND, 1994), 77-751, 251-300, and Eric Larson and Glenn A. Kent, A New Methodology for Assessing Multilayer Missile Defense Options (Santa Monica: RAND, 1995), xvii.

62 Kneale T. Marshall, "Quantifying Counterforce and Active Defense in Countering Theater Ballistic Missiles," Military Operations Research 1, no. 2 (Winter 1994): 35-48.

63 Denoon, 135.

and achieve a balanced budget, continued unconstrained growth in non-discretionary entitlement spending for Social Security, health and welfare programs[64], and military force modernization and recapitalization imperatives, make ultimate realization of such an ambitious program - estimated by the Congressional Budget Office to exceed $50 billion[65] - increasingly unlikely. Initially, in the immediate aftermath of the Gulf War, adequate Congressional funding to support the TMD acquisition programs authorized in the '91 Missile Act appeared forthcoming. However, despite bipartisan rhetoric, support has steadily eroded during the intervening years as a consequence of these budgetary pressures and changes to national priorities sought by the new Clinton Administration.[66]

Consequently, today the only funded TMD procurement programs are terminal-phase, point defense systems, the PAC-3 and Aegis SM-IVA missiles. Procurement of THAAD, BMDO's only upper-tier "core program", which had been fully funded, was recently delayed by cutting $2 billion in order to achieve savings and reallocate funds to underfunded modernization programs.[67]

Arms Control Restraints and the 1972 ABM Treaty

In addition to technological and budgetary dilemmas, our concerted approach to TMD development and deployment faces serious arms control challenges. BMDO's development of highly capable TMD systems, including upper-tier and boost-phase programs, may lead to a capability to intercept strategic ICBMs as well as theater ballistic missiles. This has serious

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64 Dennis S. Ippolito, Blunting the Sword (Washington: National Defense University, 1994), 111-147.

65 Congressional Budget Office, The Future of Theater Missile Defenses (Washington: CBO, 1994), 40-46.

66 Denoon, 144-145.

67 "Army Hopes to Speed THAAD Fielding Following DOD Cuts," Inside Missile Defense 2, No. 7 (3 April 1996): 1, 8.

implications for U.S. policymakers, the international arms control structure, and our strategic deterrence posture. While there is great ambiguity and disagreement surrounding the issue, the continued development of TMD systems that may also be capable of intercepting strategic ballistic missiles could lead to abrogation of the 1972 Anti-Ballistic Missile (ABM) Treaty.

Although the ABM Treaty was originally conceived as a measure for controlling the previous U.S. - Soviet strategic arms race, it was not intended to limit air defenses or theater tactical missile defenses. It has been widely viewed as the foundation and centerpiece of strategic nuclear arms control and a "bulwark of U.S. national security".[68] By restricting the development and deployment of strategic ballistic missile defenses, the Treaty removed incentives for nuclear arms build-ups, initially limiting strategic warheads in SALT, followed by actual reductions of strategic forces negotiated in the START I and START II agreements.

Those who strongly advocate today's continued relevance of the Treaty argue that the end of the Cold War has not made the Treaty obsolete and that it remains central to the realization of a wide range of arms reduction, arms control, and non-proliferation objectives. Since the primary role of the Treaty is to enable U.S.- Russian efforts to further reduce the sizes of their nuclear arsenals, the Treaty is still perceived to have a crucial role by enabling post-Cold War nuclear reductions and in countering proliferation. Advocates of the Treaty contend that the Russian nuclear arsenal still poses the greatest threat to U.S. security, far greater than that of any future theater missile threat and that further strategic nuclear reductions would be jeopardized amid the uncertainty raised by the prospect of highly capable TMDs. Quite possibly,

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[68] Peterson, 87.

they believe, even the reductions negotiated in START I might be endangered.[69]

Currently, the Russian Parliament (Duma) has linked ratification of START II to ongoing discussions over both NATO enlargement and interpretations of the ABM Treaty concerning testing and deployment of theater missile defense systems. With the U.S. pursuing an ambitious program to develop an effective TMD capability, they fear that further reductions in their nuclear forces could increase the risk of an American "breakout" from the ABM Treaty. Consequently, Russian leaders have become increasing insistent that the ABM Treaty be strictly observed in accordance with the so-called "narrow" interpretation. Yergeni Primakov, the new hard-line Russian foreign minister, has strenuously argued that without a limit on TMD systems and their testing, the U.S. might gain a substantial capability against Russian missiles if the Duma were to ratify START II. Thus, Russian Nationalists argue that their reductions under START II, together with U.S. deployment of missile defenses, will "simultaneously disarm, bankrupt, and strategically disadvantage their nation".[70]

Consequently, a major policy objective of the Clinton administration has been to encourage Duma ratification of START II as soon as possible by negotiating modifications to the Treaty which will clarify the current ambiguity by differentiating TMDs from strategic defenses. The U.S. preference has been for a demarcation threshold of 5 kilometers per second (km/second) to differentiate between theater and strategic ballistic missile speeds. This limit enables our development of multi-layered or "tiered", missile defenses which are a prerequisite for any "near leakproof" active defense system. This velocity

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69 George Lewis, "The ABM Treaty and The Future of Arms Control and Nonproliferation," MIT DACS Breakthroughs 5, no. 1 (Spring 1996): 11-18.

70 Jack Mendelsohn, "Focus: The View from Moscow," Arms Control Today (December 1995/January 1996): 2.

threshold effectively covers the design range of our "upper-tier" TMD systems, particularly THAAD and the Aegis LEAP anti-tactical missile systems.

Arms control enthusiasts within the Department of State and the Arms Control and Disarmament Agency have argued that both retention and clarification of the ABM Treaty are clearly in our strategic interests: failure to achieve an agreement with the Russians will result in sacrificing relatively low-cost reductions in a real threat (Russian nuclear warheads) for high-cost protection (layered TMD) against an unlikely one. Consequently, at Russian insistence, the demarcation limits recently negotiated by the State Department include both a 5 km/sec TBM and a 3 km/sec limit on missile interceptor speeds. Agreement to this lower limit, intended to assuage Russian fears and influence Duma ratification of START II, will certainly defer if not effectively prohibit our fielding of so-called "highly capable" TMD systems, by establishing a clear demarcation between theater and strategy missile defenses for ABM Treaty compliance. These advanced TMD systems, specifically THAAD and LEAP, which were designed to complement the lower-tier PATRIOT anti-tactical missile system, are critical to the success of the current Counterproliferation Initiative which emphasizes "active defense" over "counterforce" as the primary means of protecting our projection forces, especially during the entry and lodgement phases when they are most vulnerable to enemy missile-delivered WMD.

While this agreement may auger well for immediate U.S. - Russian relations and help to expedite Duma ratification of START II, we will be forced to defer or discontinue altogether our "highly capable" TMD development, testing, and deployment programs. Ironically, in our endeavor to find an agreed demarcation between strategic and theater ballistic defense missiles, the original intent of the Treaty to regulate U.S. and Soviet defenses against a

mutual strategic threat during the Cold War may now come to regulate U.S. theater missile defenses in the post-Cold War era as well.

Assessing the Ways: Strategic Concepts and Joint Doctrine

The trends within each of these influencing factors of technology, budget, and arms control are now converging and interacting to reveal several dilemmas which, collectively, further delay development of crucial missile defense programs. Prospects of deploying effective, "active defense" systems originally envisioned by the CPI are being reduced substantially.

Programs that offer the greatest potential contribution to an effective TMD, such as BPI, THAAD, and LEAP, are those that are in the earliest phase of the acquisition R & D cycle and exhibit the greatest technological, financial, and political risks. Historical experience and recent studies demonstrate that an effective TMD, one with high confidence of providing "near leakproof" protection, requires multiple layers to achieve defense in depth. Clearly, however, the enormous cost to actually develop and deploy such a design is increasingly prohibitive in an era of declining budgets. Paradoxically, those layers that provide the greatest potential effectiveness include systems least likely to be deployed. These programs are vulnerable to cancellation or deferral due to perceptions of technical inadequacy or program immaturity caused by inevitable testing failures (THAAD and LEAP), or potential acquisition "restructuring" for cost savings or reallocation to chronically underfunded modernization accounts (THAAD), or to arms control interpretations which prohibit testing and deployment because they are deemed "highly capable" against theater-range missiles and therefore possess some inherent potential against strategic missiles (LEAP and BPI).

Strategic Concepts

The implications of these interacting dilemmas for future theater strategy and campaign planning are substantial. The historical record provided by the Allied Expeditionary Force experience against the V-weapons during World War II and the recent Coalition experience with the SCUDs during the Gulf War have:

> ...opened the door for similar large scale attacks in the future. Expected advancements in missile and warhead technology will permit foes to strike at U.S. forces from longer distances with greater accuracy and lethality. If successful, these attacks will have a militarily significant effect on the conduct of the deployment and early entry, buildup and expansion, decisive operations, and redeployment and post-conflict phases of force projection operations.[71]

As Air Force Colonel Kevin McHugh has suggested, without effective TMD for force protection, a regional CINC or a Joint Force Commander may be forced to conduct operations counter to the principles of war. He could lose focus on the *objective*; become preoccupied with the defensive, instead of the *offensive*; feel compelled to disperse forces to limit losses or counter scattered attacks, sacrificing strategic concentration needed to *mass* forces and effects at the decisive place and time; neglect *economy of force* by failing to employ combat power in the most effective way by allocating resources to secondary efforts. If a CINC cannot provide reliable TMD, he may allow the enemy to deny our forces *security* and freedom of action and permit the enemy to achieve *surprise*, thereby seizing the initiative from our operational commanders. Thus, prior careful campaign planning in consideration of the principles of war by the CINC could unravel as our forces are "paralyzed" having to react to TBM

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[71] Greenwald, 17.

threats or a WMD disaster.[72]

The implications for our "power projection" strategic concept are obvious: if the force cannot be protected, it should not be projected. Additionally, our forward bases and those of our allies are becoming increasingly vulnerable, undermining our "overseas presence" strategic concept as well.

Joint Doctrine

Finally, significant doctrinal inadequacies in organizational command and control across the spectrum of CPI "pillars" appear to exist. Current Joint Theater Missile Defense (JTMD) doctrine recognizes that this threat "can only be countered by the synergistic performance achieved by coordinating and integrating all four operational elements into cohesive and coherent combat operations."[73] However, no organization has yet been designated or created to perform the critical JTMD BM/C31 role of "Counterproliferation Battle Captain" to coordinate both counterforce attack operations and active defenses, both of which are vital to effective TMD. Instead, responsibility is fragmented among the JFACC, Area Air Defense Commander, and the service and SOC component commanders.[74] And now, with the recent inactivation of 32nd Army Air Defense Command (32nd AADCOM) in Germany, there is no approved plan to establish a CONUS-based ADA command headquarters to support force projection operations.[75] Instead, current doctrine relegates the task of coordinating theater air and missile defense to the highest echelon

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72 Kevin E. McHugh, Ballistic Missile Defenses: Putting a "Roof" Over Our Forces in Theater (Newport: Naval War College, 1994), 15.

73 U.S. Joint Chiefs of Staff, Doctrine for Theater Missile Defense, Joint Pub 3-01.5, 30 March 1994, I-4.

74 Ibid., II-1 through II-11

75 James J. Cravens, "Intercept Point," Air Defense Artillery Magazine (July-August 1995): 1.

Army ADA tactical unit commander in theater.[76]

Without some compensating alternative to reliable active defenses for force protection against TBMs, our current strategic concepts of "overseas presence" and "power projection", requiring forced entry where necessary, could become self-deterring where potential costs in high casualties and OPLAN disruption exceed the gains of an intervention which is not likely to directly threaten vital U.S. interests. Such a condition will dampen domestic support and political will, and certainly limit our military ability to intervene globally at places and times of our choosing.

Achieving the Ends: Pursuing National Objectives

Observations and Conclusions

Our current National Security Strategy defines the proliferation of WMD and their missile delivery systems as a "critical priority".[77] Such a capability in the hands of a future adversary will likely constitute an enemy center of gravity which, according to current joint doctrine, should be attacked and either destroyed or neutralized as the "most direct path to victory"[78], rather than merely defended against. Theater strategy and supporting operational plans to achieve decisive victory must be "adequate, feasible, acceptable, and in compliance with joint doctrine".[79]

Our continued lack of a reliable, "near leakproof" TMD capability, compounded by these interacting trends which portend further repeated delays

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[76] U.S. Department of the Army, Decisive Force: The Army in Theater Operations, FM 100-7, (May 1995): 5-1.

[77] Clinton, 13.

[78] US Joint Chiefs of Staff, Doctrine for Joint Operations, Joint Publication 3-0 (Washington: JCS, 1 February 1995), III-20.

[79] US Joint Chiefs of Staff, Doctrine for Planning Joint Operations, Joint Publication 5-0 (Washington: JCS, 13 April 1995), I-13 through I-14.

in acquiring such a capability, undermines the implementation of a credible Counterproliferation Policy. A persistent failure to sustain such a policy will eventually lead to one of two outcomes. We could be deterred from attempting an intervention due to perceived force vulnerability and potential for high casualties thereby surrendering our political and military objectives to coercion. Or, accepting the risks of intervention, missile attacks could impede our ability to conduct quick, decisive, low-casualty operations, denying us our original limited objectives, hence forcing either our withdrawal in failure, or escalation to retaliatory, possibly nuclear, punitive responses inconsistent with our original aims and in contravention to those very values and interests espoused in our National Security Strategy of Engagement and Enlargement. Our ability to intervene in regional conflicts, whether to "promote regional stability" or "protect human rights" will have been successfully thwarted or foiled.

Recommendations

A reoriented Counterproliferation Policy, emphasizing "counterforce" options to pre-empt WMD before delivery rather than rely almost exclusively on "defenses" after delivery, shows great potential for increased cost effectiveness.[80] Such a reorientation would encourage us to leverage our technological advantages in intelligence and precision strike. This focus would be consistent with emerging "conventional deterrence" options[81] enabling a shift away from increasingly suspect concepts of nuclear doctrine which dominated the bi-polar Cold War culminating in "mutually assured destruction" (MAD), most assuredly the paramount strategic contradiction of

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[80] James J. Wirtz, "Allies and Theater Missile Defense: An ASW Approach to the SCUD Hunt," Defense Analysis 11, no.3 (1995), 255-268.

[81] Gary L. Guertner, "Deterrence and Conventional Military Forces," Washington Quarterly (Winter 1993), 141-151.

the modern era. Such a transition, toward an emphasis on deterrence by denial consistent with our technological advantages and away from our Cold War deterrent focus on threat of punitive retaliation, offers far greater credibility for a strategic "culture" codified in "Engagement and Enlargement". A pre-emptive Counterproliferation Policy will reduce risk by better enhancing our security interests and values while accommodating both current domestic budgetary pressures and international political realities.

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BIBLIOGRAPHY

"Army Hopes to Speed THAAD Fielding Following DoD Cuts," Inside Missile Defense 2, no. 7 (3 April 1996): 1,8.

Aspin, Les, and William Dickinson. Defense for a New Era: Lessons of the Persian Gulf War. Washington: Brassey's Inc., 1992.

Atkinson, Rick. Crusade: The Untold Story of the Persian Gulf War. Boston: Houghton Mifflin Company, 1993.

Blumenson, Martin. The Battle of the Generals. New York: William Morrow and Company, Inc., 1993.

Bradley, Omar N. A General's Life. New York: Simon and Schuster, 1983.

Bradley, Omar N. Bradley: A Soldier's Story. Chicago: Rand McNally and Company, 1951.

Carter, Ashton B., and David N. Schwartz, eds. Ballistic Missile Defense. Washington: The Brookings Institute, 1983.

Center for Counterproliferation Research. Weapons of Mass Destruction: New Perspectives on Counterproliferation. Ft. Lesley J. McNair: National Defense University Press, 1995.

Clinton, William J. A National Security Strategy of Engagement and Enlargement. Washington: The White House, 1995

Congressional Budget Office. The Future of Theater Missile Defenses. Washington: Congressional Budget Office, 1994.

Crane, Conrad C. "Countering Deep Theater Air Threat." West Point, NY: USMA Department of History, 1995.

Cravens, James J. "Intercept Point," Air Defense Artillery Magazine (July-August1995): 1.

Davis, Paul K., ed., New Challenges for Defense Planning: Rethinking How Much is Enough. Santa Monica: RAND, 1995.

Davis, Richard G. Strategic Air Power in Desert Storm. Washington: Air Force History and Museums Program, n.d.

Denoon, David B.H. Ballistic Missile Defense in the Post-Cold War Era. New York: Westview Press, 1995.

Department of Defense. Report on Activities and Programs for Countering Proliferation. Washington: Counterproliferation Program Review Committee, May, 1995.

Eisenhower, Dwight D. Crusade in Europe. New York: Da Capo Press, 1979.

Gavin, James M. On To Berlin: Battles of an Airborne Commander 1943-1946. New York: The Viking Press, 1978.

Greenwald, Bryon E. "SCUD Alert! The History, Development, and Military Significance of Ballistic Missiles on Tactical Operations." Association of the United States Army, The Land Warfare Papers, no. 22 (1995).

Gordon, Michael R. and Bernard E. Trainor. The Generals' War. Boston: Little, Brown, and Company, 1995.

Guertner, Gary L. "Deterrence and Conventional Military Forces," Washington Quarterly (Winter 1993): 141-151.

Ippolito, Dennis S. Blunting the Sword. Washington: National Defense University,1994.

Johnson, David. V-1, V-2: Hitler's Vengeance on London. New York: Stein and Day, 1981.

Joseph, Roger G. and John F. Reichart. Deterrence and Defense in a Nuclear, Biological, and Chemical Environment. Washington: National Defense University Press, 1995.

"Kaminski Calls Navy LEAP 'Limited, Narrow' Kill Vehicle Solution," Inside Missile Defense 2, no. 6 (20 March 1996): 8-9.

Kosiak, Steven M. Nonproliferation and Counterproliferation: Investing for a Safer World? Washington: Defense Budget Project, 1995.

Larson, Eric, and Glenn A. Kent. A New Methodology for Assessing Multilayer Missile Defense Options. Santa Monica: RAND, 1995.

Lewis, George N., "The ABM Treaty and the Future of Arms Control and Nonproliferation." MIT DACS Breakthroughs 5, no. 1 (Spring 1996): 11-18.

_____, Steve Fetter, and Lisbeth Gronlund. Casualties and Damage from SCUD Attacks in the 1991 Gulf War. Cambridge: MIT Defense and Arms Control Studies Program, 1993.

_____, and Theodore A. Postol. "Video Evidence on the Effectiveness of Patriot during the 1991 Gulf War," Science and Global Society 4 (1993): 1-63.

Marshall, Kneale T. "Quantifying Counterforce and Active Defense in Countering Theater Ballistic Missiles." Military Operations Research 1, no. 2 (Winter 1994): 35-48.

Mazarr, Michael J. "Going Just a Little Nuclear: Nonproliferation Lessons from North Korea." International Security 20 (Fall 1995): 92-122.

McHugh, Kevin E. Ballistic Missile Defenses: Putting a'Roof" Over Our Forces in Theater. Newport: Naval War College, 1994.

McNaughter, Thomas L. "Ballistic Missiles and Chemical Weapons." International Security 15, no. 2 (Fall 1990): 5-34.

Mendelsohn, Jack. "Focus: The View From Moscow," Arms Control Today (December 1995-January 1996): 2.

Mueller, John. "The Perfect Enemy: Assessing the Gulf War." Security Studies 5, no. 1 (Autumn 1995): 77-117.

Nonproliferation Center. The Weapons Proliferation Threat. Washington: Director of Central Intelligence, March 1995.

Perrow, Charles. Normal Accidents: Living with High Risk Technologies. Basic Books, 1984.

Perry, William J. Proliferation: Threat and Response. Washington: Office of the Secretary of Defense, 1996.

Peterson, Joseph. "Theater Missile Defense, Beyond Patriot?" Monterey: Naval Postgraduate School Master's Thesis, June 1994.

Postol, Theodore A. "Lessons of the Gulf War Experience with Patriot." International Security 10 (Winter 1991-1992): 119-171.

_____. "Technology and Policy of Weapons," Defense and Arms Control Studies Program (DACS) lectures, MIT, Cambridge, MA, Fall Term 1994.

Ranger, Robin. "Theater Missile Defenses: Lessons from British Experiences with Air and Missile Defenses." Comparative Strategy 12. (1993): 399-413.

Rubenson, David and Anna Slomovic. The Impact of Missile Proliferation on U.S. Power Projection Capabilities. Santa Monica: RAND Corporation

Scales, Robert H. Certain Victory: The U.S. Army in the Gulf War. Washington: Brassey's, 1994.

Schneider, Barry R. Radical Responses to Radical Regimes: Evaluating Preemptive Counterproliferation. Washington: National Defense University, 1995.

Schwarzkopf, H. Norman. It Doesn't Take a Hero. New York: Linda Grey Bantam Books, 1992.

Shalikashvili, John M. National Military Strategy of the United States of America: A Strategy of Flexible and Selective Engagement. Washington: USGPO, 1995.

Snodgrass, David E. Attacking the Theater Mobile Ballistic Missile Threat. Maxwell AFB, AL: Air University School of Advanced Air Power Studies, n.d.

U.S. Department of the Army. Decisive Force: The Army and Theater Operations. FM100-7, May 1995.

U.S. General Accounting Office. Cruise Missiles: Proven Capability Should Affect Aircraft and Force Structure Requirements. Washington: U.S. General Accounting Office, 1995.

U.S. Joint Chiefs of Staff. Doctrine for Joint Operations. Joint Pub 3-0, 1 February 1995.

U.S. Joint Chiefs of Staff. Doctrine for Theater Missile Defense. Joint Pub 3-01.5, 30 March 1994.

U.S. Joint Chiefs of Staff. Doctrine for Planning Joint Operations. Joint Pub 5-0, 13 April 1995.

Wander, Thomas W., and Eric H. Arnett, eds. The Proliferation of Advanced Weaponry: Technology, Motivations, and Responses. Washington: American Association for the Advancement of Science, 1992.

Watson, Bruce W., Bruce George, Peter Tsouras, and B.L. Cyr. Military Lessons of the Gulf War. California: Presidio Press, 1991.

Werrell, Kenneth. The Evolution of the Cruise Missile. Maxwell AFB, AL: Air University Press, 1985.

Wheeler, M., Brooks, B., Doyle, J., and Rhoades, R. Implications of Counterproliferation Initiative for the U.S. Army. McLean, VA: SAIC, 1994

White, John P. Directions for Defense: Commission on Roles and Missions of the Armed Forces. Washington: Office of the Secretary of Defense, 1995.

Wirtz, James J. Counterforce and Theater Missile Defense: Can the Army Use an ASW Approach to the SCUD Hunt? US Army War College Strategic Studies Institute, 1995.